



**RANCHO CORDOVA'S WATER CONTAMINATION:
IF THERE HAD BEEN A CITY OF RANCHO CORDOVA,
IT NEVER WOULD HAVE HAPPENED**

Distribution

Rancho Cordova's water contamination has come in three waves. The oldest wave originates from dumping in both dredger channels (1950-1964) and Buffalo Creek (1950-1985). It consists of a core of trichloroethylene (TCE) and other chemicals that stretches from Aerojet to Zinfandel Drive and Folsom Boulevard. This core is in turn surrounded by a very dilute halo of perchlorate extending to Mather Field Road. The TCE core of this plume was in the news in the mid-1980s, resulting in carbon filters being placed on three Rancho Cordova wells. Unfortunately, perchlorate (ClO_4^-) and nitrosodimethylamine (NDMA) pass through these filters, so these wells are now lost.

The second wave that began shutting down wells in 1997 consists of treated water injected (1988-1998) into the groundwater beneath Rancho Cordova's office / industrial complex south of US 50. Trichloroethylene was removed from this water, but it contains large amounts of perchlorate dumped during rehabilitation of Minutemen missiles in the early 1980s. A small plume of NDMA was also accidentally sucked into this treated water and spread underneath US 50.

The last wave consists of NDMA pumped up, piped downhill, and dumped in the area of White Rock Road east of Sunrise (1985-1993). The purpose of this dumping was to protect the groundwater beneath Intel and the new Folsom High School from contamination. This plume is heading towards Rancho's new housing developments at Village of Zinfandel, Rio del Oro, and Madison at Mather.

Remediation

Aerojet is selling land along Folsom Boulevard between Folsom Auto Mall and Sunrise Boulevard to raise \$50 million dollars. This money will then be used to build a north-south line of extraction wells along Beclan and Zinfandel Drives between the American River and Mather Field's runway. This water will be piped back to Aerojet and the Folsom Water District for treatment, and then used for landscaping and industrial needs in new developments.

The Contaminants

Perchlorate (ClO_4^-). A salt used as a source of oxygen in solid rocket fuel. The human metabolism confuses perchlorate with the vital micronutrient iodide, and so concentrates ClO_4^- in certain parts of the body. Two key questions need to be conclusively answered to evaluate perchlorate toxicity: 1. Does perchlorate react in any amount with human enzymes? 2. At what point is perchlorate's passive blockage of iodide transport into the thyroid gland detrimental? The first question is being addressed by human experiments underway at Harvard and Munich and a statistical analysis of thyroid birth defects in California and Texas. Rat data on the second question is now available, and the experts are debating what conclusions should be drawn. The current state of the knowledge on perchlorate toxicity can be summarised as follows:

5 parts-per-billion - perchlorate at this concentration is associated with a doubling of the thyroid birth defect rate in Rancho Cordova and Southern California. Further analysis is underway to determine whether this increase is due to exposure to perchlorate or genetic predispositions in the Hispanic population. This was the US EPA's suggested safe dose for infants.

32 parts-per-billion - The US EPA's suggested safe dose for adults.

320 parts-per-billion - Adult human exposure model equivalent associated with 10-20% iodide leakage from rat thyroids.

3200 parts-per-billion - Adult human exposure model equivalent associated with enlargement of rat thyroid cells. This is the point where the US EPA was confident it had found an adverse effect, but a majority of the external peer review panel disagreed and said the figure should be higher.

32,000 parts-per-billion - Adult human exposure model equivalent associated with increased cell division of rat thyroid cells. All parties agree that this is an adverse effect because of the increased risk of thyroid cancer.

100,000 parts-per-billion - Adult human exposure model equivalent associated with decrease in rat thyroid hormone levels that clearly cause subnormal brain development.

Trichloroethylene (TCE) and Tetrachloroethylene (Perchloroethylene, PCE, perc). Fire retardant solvents that damage nerve, bone, and liver tissue. This damage can in turn cause leukemia. TCE and PCE are widely used in machine shops, dry cleaning, and rubber glues. TCE is the contaminant that received so much attention in Rancho Cordova and other parts of the country in the 1980s. The salt perchlorate travels twice as fast in groundwater as the oily TCE, so groundwater plumes from rocket factories like Aerojet

generally consist of a TCE core surrounded by a perchlorate halo. The Regional Water Quality Board wanted to impose a limit of 1/2 part-per-billion on the Air Force's Mather TCE plume in Lincoln Village, but tolerated up to 10 times that level in four Rancho Cordova wells contaminated by Aerojet.

Tetrachloroethylene (PCE) is similar to trichloroethylene, except it contains an additional chlorine atom. In groundwater PCE flows slightly slower than TCE, so if the PCE at Zinfandel and Folsom Boulevard is from Aerojet, it was dumped earlier than most of the TCE. An alternative explanation would be that the PCE is from a local drycleaners.

Nitrosodimethylamine (NDMA). NDMA is the most potent poison in cigarette smoke, and is largely responsible for the increased prohibition of smoking in public places. It is colorless and odorless, but 250 times more toxic than TCE. NDMA very efficiently methylizes DNA, leading to miscarriage- and cancer-causing mutations. If inhaled, NDMA is associated with lung cancer; if ingested, it is associated with a wide variety of cancers in lab animals, the most prominent being liver cancer.

During the Korean War, Aerojet pioneered the conversion of NDMA into Unsymmetrical Di-Methyl Hydrazine (UDMH) for use in liquid rocket fuel. When UDMH is exposed to air, it is completely reconverted to NDMA after a period of 20 years. During the development of the Titan rocket in the 1950's-1960's, Aerojet daily used several railroad tank cars of UDMH at the liquid rocket testing facility along Prairie City Road. Consequently, the groundwater immediately south of Intel and Folsom High School constitutes a 1 in 100 cancer risk due to NDMA. To protect Folsom's groundwater from contamination, this water was pumped up and dumped in the White Rock Road area of the Aerojet Superfund Site. This NDMA plume is currently heading for Rancho Cordova's new developments at Village of Zinfandel, Rio del Oro, and Madison at Mather. The NDMA that closed down wells last March, however, is likely from a single drum of NDMA or UDMH dumped into Buffalo Creek decades ago. NDMA moves more slowly through groundwater than TCE, so it is trailing the TCE plume.

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For further information on perchlorate, see
<http://www.zerowasteamerica.org/Perchlorate.htm>